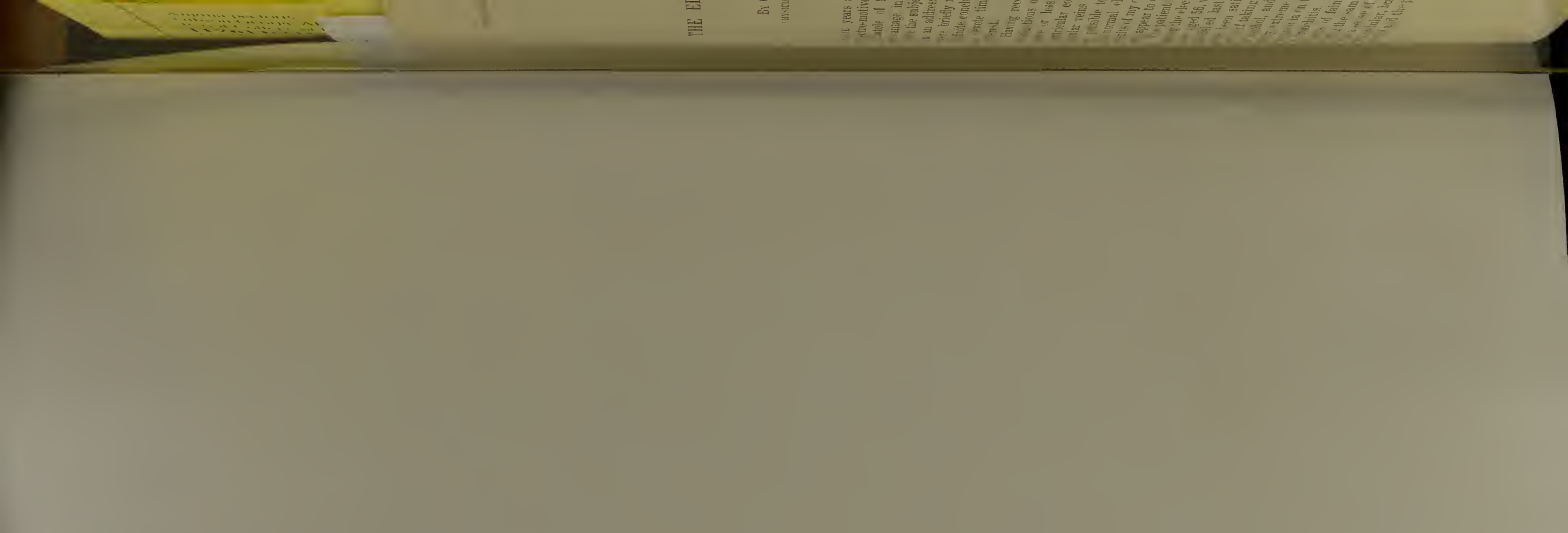

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THE ELECTRO-MOTIVE CHANGES IN HEART-BLOCK.

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[PRELIMINARY NOTE.]

SOME years ago it seemed to me that the study of the electro-motive changes produced by the systole and diastole of the heart might be turned to practical advantage in clinical research, and for a considerable time the subject engaged my attention in hospital work. In an address delivered at Norwich[1] the general results were briefly referred to. As these, however, led to no definite conclusions, the subject was put aside in order to devote time to other matters of more urgent clinical interest.

Having recently had occasion to make thorough investigations on a series of cases of heart-block, with more or less complete dissociation of auricular and ventricular contraction, as proved by tracings from the jugular veins and apex, it occurred to me that it might be possible to obtain evidence of some departure from the normal electro-motive changes in such cases. The results of my observations have realized my expectations, and appear to deserve a short preliminary note.

The patient who furnished the opportunity of investigating the electro-motive changes in heart-block is a cabman, aged 56, whose case was described by me in a paper published last year on bradycardia.[2] His antecedents have been satisfactory, but he has for long been in the habit of taking somewhat more than the average amount of alcohol, and his work has necessarily exposed him to every extreme of climate. He has suffered from acute pneumonia on two occasions, and has had several attacks of bronchitis. During the last two years he has had attacks of faintness occurring at varying intervals, and during the same period has had severe pain in the chest, with a sense of constriction. The arteries are thickened and nodular, but not distinctly tortuous. The vessels are turgid and the pressure is high, being equal to 170 mm. Hg.

The rate of the pulse is 36 per minute, and it is perfectly regular. A distinct impulse is seen in the sixth intercostal space close to the anterior axillary line. The borders of the heart extend 2 in. to the right and 5 in. to the left of mid sternum. On auscultation there is a loud blowing systolic murmur heard over the whole precordia, and propagated for a considerable distance in every direction over the chest. The maximum intensity of this murmur is in the mitral area. No other murmur is audible. The second sound is clear and ringing, especially in the aortic region; it is sometimes reduplicated. There are no pulmonary symptoms, and the physical signs of the chest reveal no abnormality. The renal functions are healthy. As regards the digestive system, there is slight increase in the size of the liver. The nervous system gives no obvious symptoms except the faintness, giddiness, and pain already mentioned. The radial pulse yields a tracing showing a quick ascent and a slow descent; in its features it closely resembles the pulsus bisferiens; it has a few little waves on the line of descent. Simultaneous tracings of the jugular and radial pulses show distinct undulations of the venous pulse between the radial pulsations, and the same may be said of the simultaneous tracing obtained from the apex and the radial artery. In each cycle there is a distinct wave seen in the apex beat intermediate between the principal pulsations.

When examined by means of the fluorescent screen—for kind assistance in which investigation my thanks are due to Dr. Hope Fowler, of the Electric Department of the Royal Infirmary—the dissociation of auricular and ventricular movements could be clearly seen, as has already been described by Ritchie,[3] by Brouardel and Villaret,[4] and by Magee Finny.[5] We were able to determine that the auricles contracted three or four times, as a rule, for each ventricular systole.

The electro-motive changes which accompany the movements of the heart have been studied by several observers, amongst whom may be mentioned Engelmann,[6] Marchand,[7] Burdon-Sanderson and Page,[8] and Waller.[9] My own observations have been carried out by means of the simple apparatus employed by Waller,[10] who first aroused my interest in the subject. By this method the electric variations are studied by means of Lippmann's capillary electrometer. Leading off from the basal region of the precordia to the acid, and from the apical to the mercury, the usual diphasic movements of the capillary column were clearly seen preceding the apex beat, and evidently resulting from ventricular systole. But in the interval between these movements other smaller waves were distinctly seen, and can only be attributed to the systole of the auricles. As these latter movements were small, as observed by the direct method with the microscope, it was impossible to be certain of their exact character, but they seemed, like the ventricular, to be

diphasic. When thrown upon the screen by means of the projection microscope, they were obviously diphasic in their character.

The whole subject will have my earnest attention in the immediate future with methods allowing of graphic records, but in order to evoke the interest of others who are, like myself, engaged in the study of heart-block from the clinical point of view, it seems advisable to publish this short preliminary note. In doing so it is a pleasant duty to express my warm thanks to Dr. N. H. Alcock and Dr. Sutherland Simpson for many kind suggestions, and to my Clinical Tutor, Dr. Ritchie, and my House-Physician, Dr. Dalmahoy Allan, for their loyal and untiring assistance.

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